The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A device, comprising:

a substrate having a cavity that extends into the substrate, said cavity having an opening on at least one surface of the substrate;

an anode positioned within the cavity of the substrate;

a cathode positioned the opening of said cavity, wherein the anode receives electrons emitted by the cathode, and wherein the anode produces an electrical current to an external source in response to receiving the electrons;

a first grid having at least one aperture to allow the passage of electrons therethrough, wherein the first grid is constructed of an electrically conductive material, and wherein the aperture of the first grid is positioned between the cathode and anode;

a seal for creating a controlled environment in an area surrounding the first grid, cathode and anode, wherein the controlled environment allows for electron flow between the cathode, first grid and anode;

a circuit for heating the cathode, and

a control circuit for controlling the magnitude of the flow of electrons through the aperture of the first grid, thereby controlling the electrical current produced by the anode.

2. The device of Claim 1, wherein the first grid is mounted on the anode.

3. The device of Claim 1, wherein the first grid is configured with a plurality of apertures sized to allow the first grid to control the flow of electrons from the cathode to the anode when a control voltage is applied to the first grid.

4. The device of Claim 1, further comprising a second grid having a plurality of apertures configured for allowing the passage of electrons therethrough, wherein the aperture of the second grid is positioned between the cathode and anode,

and wherein the second grid controls the flow of electrons from the cathode to the anode when a control voltage is applied to the second grid.

5. The device of Claim 4, wherein the plurality of apertures of the second grid are aligned with the plurality of apertures of the first grid.

6. The device of Claim 4, wherein the cathode is attached to the substrate to create a vacuum environment in an area surrounding the first grid, second grid, anode and cathode.

7. The device of Claim 1, wherein the cathode comprises an electron emitting coating disposed thereon.

8. The device of Claim 7, wherein the electron emitting coating is comprised a metal tricarbonate.

9. The device of Claim 1, wherein the distance between the anode and cathode is between 0.5 microns and 2 millimeters.

10. The device of Claim 1, wherein the grid is a material selected from the group consisting of tungsten, gold, and tantalum.

11. The device of Claim 1, wherein the controlled environment is an enclosed area surrounding the grid, cathode, and anode, wherein the enclosed area has a vacuum drawn therein.

12. The device of Claim 1, wherein the controlled environment is an enclosed area filled with a gas selected from the group consisting of hydrogen, helium, argon, and mercury.

13. A method of manufacturing a device, wherein the method comprises:
etching a cavity in a semiconductor substrate;
forming an electrically conductive member disposed inside the cavity;
filling the cavity with a filling material;

depositing a first conductive layer over the substrate and the filling material;

etching the first conductive layer, thereby generating at least one aperture in the first conductive layer;

removing the filling material beneath the first conductive layer, wherein removing the filling material provides a hollowed cavity that is partially covered by the first conductive layer;

providing a second member having electron emitting properties, wherein the second member is suspended over the hollowed cavity, and positioned so that at least one aperture of the first conductive layer is positioned between the second member and the electrically conductive member disposed inside the cavity; and

forming a seal for creating a controlled environment in an area surrounding the hollowed cavity, electrically conductive and the second member.

14. The method of Claim 13, wherein the filling material is made of a nonsolderable and nonconductive material.

15. The method of Claim 13, wherein the filling material is polyimide.

16. The method of Claim 13, further comprising a step of forming a first oxide layer on the semiconductor substrate, wherein the first oxide layer covers a bottom and a plurality of side walls of the cavity.

17. The method of Claim 13, wherein the electrically conductive member is formed by employing a process selected from the group consisting of high temperature metal sputtering, regular metal sputtering, and chemical vapor deposition of a metal to form the electrically conductive member.

18. A device, comprising:

a substrate having a cavity that extends into the substrate;

an anode constructed of an electrically conductive material, wherein the anode is positioned in the cavity of the substrate;

a cathode positioned over the cavity of the substrate, wherein the anode is configured to receive electrons emitted by the cathode, and wherein the anode is configured to produce an electrical current to an external source in response to receiving the electrons;

a seal for creating a controlled environment in an area surrounding the grid, cathode and anode; and

a circuit configured for heating the cathode.

19. The device of Claim 18, wherein the cathode is attached to the substrate to create a vacuum environment in an area surrounding the anode, cathode and grid.

20. The device of Claim 18, wherein the cathode contains an electron emitting coating disposed thereon.

21. The device of Claim 20, wherein the electron emitting coating is made of a tricarbonate.

22. The device of Claim 18, wherein the space between the anode and cathode is between 0.5 microns and 2 millimeters.